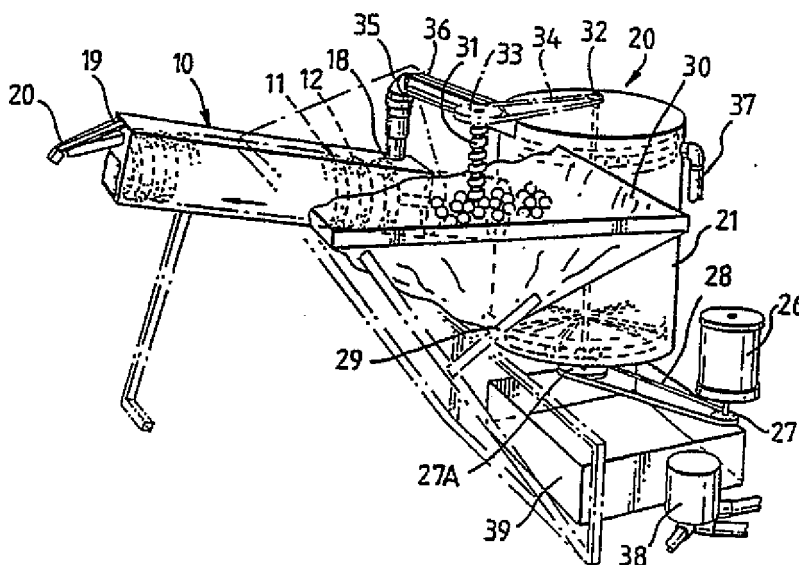




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(54) Title: APPARATUS FOR CLEANING DISCRETE ARTICLES



(57) Abstract

An apparatus for cleaning articles such as fruit, vegetables, eggs and golf balls including a helical conveyor (11) having a spiral channel (12) therein articles are located in the spiral channel (12) and are transported along the helical conveyor (11) upon rotation thereof. One or more spaced fender elements are located around the helical conveyor (11) to prevent articles from falling off the conveyor. When the conveyor is rotated the articles are cleaned by contact with the sides of the spiral channel (12) which can be lined with fabric, bristles or other cleaning surfaces. Various auxiliary devices such as washers, driers, or wax applicators can be associated with the apparatus.

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Title of the Invention

Apparatus For Cleaning Discrete Articles

Technical Field

5 THIS INVENTION relates to an apparatus for cleaning articles and is particularly directed although not limited to an apparatus for cleaning produce such as fruit, vegetables, eggs or articles such as balls, particularly golf balls.

Background Art

10 Cleaning of articles is a necessary step in most industries and particularly in the food handling industries. Primary produce such as fruit, vegetables or eggs are almost always required to be cleaned before packaging and delivery to the consumer. In certain countries, cleaning is
15 compulsory through legislation although most countries also clean such articles for aesthetic reasons.

In the past, articles such as fruit, vegetables and eggs have been cleaned by immersion into a container containing a desired cleaning agent. A disadvantage with
20 this type of cleaning process is that the immersion is normally carried out in a batchwise fashion and not a continuous fashion and delicate articles such as eggs or thin skinned fruits can become bruised or damaged in the process.

More recently, produce articles have been cleansed
25 while being conveyed from one point to another. The conveyancing allows the articles to proceed through a number

of treatment steps i.e. cleansing, drying, and also allows the process to be performed in a continuous manner. These processes use conveyor belts or rollers to transport the articles through treatment stations. A disadvantage with such a process is that the articles may be bruised or subject to damage by contact with other articles during transportation. The use of conveyor belts provide further difficulties in that to properly clean an article, it is necessary to expose all surfaces of the article to the treatment step. In conveyor belts, this is generally not possible as articles are merely transported by the conveyor belt and, for instance, to spray clean an article, it is necessary to have a number of spray jets located at different positions around the conveyor belt in an attempt to contact each surface of the article.

Conveying articles by means of rollers is also subject to disadvantages. Firstly, the distance between adjacent rollers must be adjusted to the size of the articles transported therealong. If the spacing between the rollers is too large, articles can become wedged between rollers or pass through the spacing between the rollers, and if the spacing between adjacent rollers is too small, articles are not efficiently transported along the rollers. Thus, an apparatus containing spaced rollers can only be used with articles of similar sizes and to transport articles of smaller or larger sizes it is necessary to adjust the spacing

between each of the rollers. A further disadvantage with the use of rollers, as with the use of conveyor belts, is that articles may be subjected to bruising or damage by contact with adjacent articles or by transportation along the rollers.

Disclosure of the Invention

It is an object of the invention to provide an apparatus for cleaning articles which at least partially overcomes the abovementioned disadvantages.

In one aspect, the invention resides in an apparatus for cleaning discrete articles, said apparatus comprising a helical conveyor having a channel between adjacent turns of sufficient width to accommodate discrete articles therein, and at least one fender element for assisting said articles in their movement along the channel when said helical conveyor is rotated about its longitudinal axis, whereby said articles are cleaned by contact with the sides of said channel.

An article located within the channel of the helical conveyor will be moved along the helical conveyor upon rotation of the conveyor. The article is prevented from falling off the conveyor by the fender element and therefore is transported along the conveyor. Rotation of the helical conveyor also may result in an article being rotated within the channel which exposes all faces of the article for cleaning. A further advantage of the apparatus of the

invention is that articles can be conveyed along the helical conveyor singularly thereby minimising damage or bruising of articles through contact with each other.

5 The apparatus of the invention can be used with almost any type of article and has particular benefits in cleaning of easily damaged or bruised articles such as fruits, vegetables, eggs etc. However, the apparatus of the invention is not limited to the above articles and also finds utility in the sporting industry for cleaning of games balls
10 such as golf balls.

 The apparatus of the invention may be of any suitable length and the helical conveyor may be of any suitable dimension to allow an article to be accommodated within the channel.

15 An inlet and outlet may be associated with the helical conveyor. The inlet may be configured and/or sized to allow only articles of specified sizes or shapes to enter onto the helical conveyor. Similarly, the outlet can also be configured and/or shaped to allow exit only of articles of a
20 predetermined configuration or size. The inlet and outlet can therefore be used as a sorting or grading step for the articles to be cleaned along the helical conveyor. The apparatus may be provided with a number of inlets or outlets and in particular may be provided with a single inlet and a
25 number of outlets, each outlet being of a different size and/or configuration to allow articles to be graded

according to shape or size. If necessary, the outlet or end or the helical conveyor may be associated with further article treating means.

Several apparatus according to the invention may be operatively associated with each other. Thus, the outlet or end of one helical conveyor may be operatively associated with an inlet or entry of a second apparatus according to the invention. This operative connection allows different apparatus to be associated with different treatment steps.

Thus, a first apparatus according to the invention may be associated with a first cleaning process, for instance, wash sprayers while a second apparatus according to the invention may be associated with a further treatment step such as air drying or contact drying.

When a large number of articles are required to be cleaned, a number of apparatus according to the invention may be associated in a parallel arrangement each having an inlet or entry operatively associated with a common source of articles such as a hopper. In this arrangement, the inlet or entry of each apparatus according to the invention may be configured to accept only articles of a specific shape or size thereby providing an initial sizing or grading of articles.

The apparatus according to the invention can be associated with a number of different treatment steps each acting in association with a different portion of the helical

conveyor. Thus, the helical conveyor may be provided with wash sprayers acting on one portion of the conveyor and a drying step such as blow dryers acting on a second portion of the conveyor. It is preferred that articles pass initially through the wash sprayer step and then through the drying treatment step. Other treatment steps may be associated with the helical conveyor such as scrubbers and/or wax or polish applicators.

The helical conveyor is provided with a channel extending between adjacent turns of the conveyor. The helical conveyor may be formed by molding and can comprise an auger. The auger can comprise plastics, metal or alloys thereof, wood or combinations thereof. The particular type of material will depend on the treatment steps thus aluminium augers would be unsuitable for use with a caustic treatment step while some plastics may be unsuitable with high temperature treatment steps.

Alternately, the helical conveyor may be formed by cutting or machining or otherwise impressing a helical channel into the surface of an elongate cylindrical member. One particularly preferred form of the invention is where the elongate cylindrical member comprises a brush having a central shaft and radially extending bristles. A helical channel is cut or machined into the bristles or is impressed into the bristles by winding of a flexible member such as a strap or wire around the brush in a helical formation thereby

forming a helical channel.

A further preferred form of the invention is where the elongate cylindrical member is provided with a deformable surface. A flexible member such as a strap or wire is wound
5 around the deformable surface and is tensioned to form the helical channel. The deformable surface can comprise a thick cloth, foam material or other deformable materials. Suitably, the deformable surface can comprise a layer of deformable material such as cloth or foam materials on the
10 surface of the elongate cylindrical member.

The length of the channel can be determined by the number of turns within the helical conveyor. Furthermore, by varying the spacing between adjacent turns, an article can be transported along the helical conveyor at different speeds.
15 The helical conveyor of the invention may be provided with portions of closely spaced adjacent channels. These portions may be associated with particular treatment steps. An article transported along the helical conveyor will be conveyed more slowly through the treatment step by virtue of
20 the closely spaced channels and therefore can be more efficiently treated by that treatment step.

The channel may be provided with a variety of internal profiles suitable for conveyancing of articles. Typically, the channel is in a substantially U or V shaped
25 configuration. Such channels are particularly preferred for articles of roughly spherical nature such as certain fruits

or vegetables or balls. The width and depth of the channel may be varied depending on the size of the articles to be cleaned thereby. The channel may also advantageously be used to sort and grade articles according to their peripheral shape. Thus, spherical articles can be snugly accommodated within a U shaped channel configuration while non-spherical articles cannot. This can advantageously be used in the produce handling industry particularly in sorting tomatoes where spherical tomatoes are more prized than irregularly shaped tomatoes.

The channel may be of an uneven depth throughout its length with the shallower portions of the channel functioning to raise the articles from the channel. These shallower portions of the channel may be associated with treatment steps to provide a larger surface area of the article for treatment. For instance, the helical conveyor can be provided with a shallower channel portion adjacent a physical scrubbing step whereby articles can be more efficiently scrubbed by brushes or other scrubbing members.

The channel of a portion of the helical conveyor can be lined with materials to aid in the cleansing of articles in the channel. The channel may be lined with cloth which may comprise natural and/or synthetic fibres. The cloth may be of the non-woven type. The cloth may be absorbent to dry articles in the channel.

The speed of rotation of the helical conveyor

around its longitudinal axis can be varied to vary the speed by which an article moves along the helical conveyor at a particular point. The rate of rotation may be computer controlled. The helical conveyor may also be rotated in the other direction to move articles in the opposite direction. This allows articles to move back into a particular treatment step to allow several treatments of the same article. An advantage of this operation is that the apparatus is not required to be provided with several of the same treatment steps which increase manufacturing costs of the apparatus.

The apparatus of the invention is provided with at least one fender element for assisting the articles in their movement along the channel. The fender element functions to prevent an article from falling off the helical conveyor upon rotation thereof. The fender element may be of any suitable size shape or length and preferably extends along the length of the helical conveyor between the entry and exit points of an article transported therealong. The fender element may comprise an elongate substantially rectangular plate member.

It is preferred that the apparatus is provided with a pair of spaced fender elements and that the articles are located between the fender elements. The fender elements may be angularly spaced above the periphery of the helical conveyor. The spacing between the fender elements and the helical conveyor may be varied according to the type of article transported along the conveyor. Thus, for large

articles, the fender elements may be spaced substantially above the periphery of the helical conveyor while for small articles, the fender elements may be closely spaced above the periphery of the helical conveyor. The space between the fender elements and the helical conveyor may be such to allow separation of dirt and other foreign materials from the articles. The spacing should be sufficiently small to prevent the articles from passing therethrough.

The fender elements as mentioned above can be angularly spaced around the periphery of the helical conveyor. In a preferred form, one fender element is positioned vertically above the conveyor whilst the second fender element is spaced at an acute angle from the first fender element. The angle is preferably 45° . It is preferred that the second fender element is spaced such that rotation of the helical conveyor results in a point of the conveyor moving past the second fender element before the first fender element. Thus, for a helical conveyor which rotates in a clock-wise fashion, it is preferred that the second fender element is located to the left of the first fender element when viewed in top plan.

The pair of fender elements may be connected by a web portion thereby defining an inverted channel. The spacing between the web portion and the helical conveyor may be made adjustable by screws or other adjustment means. This particular form is suitable for cleaning hard objects such

as golf balls. The channel can be dimensioned or adjusted to force the golf ball into hard contact with the helical conveyor thereby improving the cleaning operation.

When the abovementioned inverted channel is present, a number of these can be angularly spaced around the helical conveyor as articles are prevented by the web portion from exiting the channel. Thus, an apparatus comprising a number of these channels can efficiently cleanse a large number of articles such as golf balls. The inverted channel arrangement may also be used in association with the open channel fender elements described above.

The fender elements may be lined or provided with a soft covering to minimise bruising of articles transported along the helical conveyor. Alternately, the fender elements may be provided with bristles or other form of contact cleansing devices to aid in the cleansing of the articles while in the channel. The fender elements may be provided with cut-out portions of varying shapes or sizes to allow exit of articles according to the shape or size. This allows for sorting or grading of articles while being conveyed and cleansed along the helical conveyor. In a preferred form, one or both of the fender elements are provided with stepped cut-out portions towards one end thereof to sort articles conveyed along the helical conveyor according to size.

In use, articles are located or fed onto one end of the helical conveyor and are conveyed therealong. If the

helical conveyor comprises an elongate cylindrical brush provided with a helical channel, rotation of the conveyor cleanses the articles by action of the bristles. Alternately, if the helical conveyor comprises an auger, the
5 auger may be coated or lined with an abrasive or other forms of cleansing material such as bristles or cloth which function to clean the articles while being conveyed by the channel.

10 A further advantage of the helical conveyor is that articles may exhibit rotation within the channel upon rotation of the conveyor and thus all surfaces of the article are presented for cleaning. As an article is transported along the channel it will contact one of the fender elements. Depending on the size and shape of the article, the article
15 may either be dislodged from the channel and fall against the second fender element whereby it will again locate in an adjacent channel and be further transported, or the article may stay within the channel and may be transported therealong whilst contacting the first fender element.

20 The apparatus can be associated with any number of further external treatment steps such as sprayers, external brushes or dryers. The dryers may be in the form of air dryers, liquid dryers or radiation dryers. Further treatments may included waxing or polishing the articles.
25 The apparatus of the invention may be immersed into a suitable medium such as cleansing fluid.

Brief Description of the Drawings

The invention will be better understood by reference to the following descriptions of preferred embodiments thereof as illustrated in the accompanying drawings in which:

Figure 1 is a perspective view of an apparatus for cleaning discrete articles and associated with a primary wash tank and an article feed hopper.

Figure 2 is an end elevation view of the helical conveyor as disclosed in Figure 1.

Figure 3 is a perspective view of the helical conveyor as disclosed in figure 1.

Figure 4 is a part perspective view of the primary wash tank of Figure 1.

Figure 5 is a perspective view of a second embodiment of the apparatus according to the invention.

Figure 6 is a perspective view of a third embodiment of the apparatus according to the invention.

Description of Preferred Embodiments of the Invention

In Figures 1-4 there is disclosed an apparatus for cleaning articles such as golf balls.

The apparatus comprises an elongate housing 10 of substantially rectangular cross-section. Within the housing there is located a helical conveyor 11 defining a channel 12. The helical channel is formed by wrapping thick cloth 13 (see Figure 2) around an elongate cylindrical member 14. A

metal flexible strap (not shown) is wound around the cloth in a helical fashion and is tensioned to form a helical channel within the thick cloth. Alternately, the helical conveyor can comprise an auger which is lined with cloth. The first
5 few turns of the channel adjacent the entry or inlet of the helical conveyor may be lined with a rubber compound to provide protection against wear and tear in this area. This particular area is subject to increased wear and tear as an article deposited in the channel at the inlet or entry of the
10 helical conveyor is given an initial forward thrusting motion which may increase the wear of the cloth around this area if not protected.

A pair of fender elements 15, 16 are located above the helical conveyor and slightly spaced therefrom (see
15 Figure 2). In this embodiment, the fender elements are connected by a web portion 17 to define an inverted substantially U shaped channel. The web portion 17 is provided with an opening 18 to allow an article to pass into the channel. Rotation of the helical conveyor 11 results in
20 the article being moved along the conveyor whilst being trapped between the fender elements 15, 16 and the web portion 17. For golf balls, the inverted U shaped channel can be positioned with respect to the helical conveyor such that the golf balls are firmly pressed into the cloth 13
25 thereby maximising the cleansing of the golf balls whilst being moved along the channel. The other end of the inverted

channel is provided with an outlet 19 and an exit chute 20. The thick cloth results in a thorough cleansing and drying of the golf ball or other article whilst being transported along the helical conveyor.

5 In Figure 1 the apparatus is further associated with a primary wash tank 20 which functions to wash and scrub articles before entry into the helical conveyor. The primary wash tank 20 includes a substantially cylindrical housing 21 having arranged on its inner surface a spiral ball guide 22
10 (see Figure 4). Within the cylindrical housing 20 there is mounted for rotation a brush 23 having radially extending bristles 24 extending from a central shaft 25. Each end of the shaft is maintained for rotation by bearings (not shown).

 The primary wash tank 20 is preferably manufactured
15 from steel and the spiral ball guide 22 is defined by a steel spiral weldably attached to the interior surface of the cylindrical housing 21. The central shaft 25 of brush 23 is rotated by a motor 26 through drive pulleys 27 and 27A and drive belt 28 (see Figure 1).

20 The spiral ball guide 22 is lined with resilient cushioning material (not shown) which is further overlaid by a cleansing surface which in the embodiment comprises an outdoor carpet material.

 The primary wash tank is provided with an article
25 inlet 29 at the base thereof which is associated with the lowest point of the spiral ball guide 22. The ball guide at

this point can be provided with a lip (not shown) to prevent articles such as golf balls from dropping off the spiral ball guide 22 before being picked up by the brush 23.

5 The brush 23 is provided with extended bristles 24 adapted to assist in the picking up of the articles through the article inlet 29.

A hopper 30 is provided adjacent article inlet 29 and allows for the storage of a multiplicity of articles to be fed into the primary wash tank. An article stirring or
10 agitating auger 31 is provided in the hopper to keep the articles in an agitated state thereby minimising sticking or adhesion between articles. The agitating auger 31 is operated by rotation of shaft 25 via pulleys 32 and 33 driven by drive belt 34.

15 The upper end of the spiral ball guide 22 is connected to the inlet or entry of the helical conveyor 11 by pipe 35. Drain bars 36 are provided immediately adjacent the outlet of the primary wash tank to drain excess water from the articles prior to entering the helical conveyor 11.
20 Rotation of brush 23 provides sufficient momentum for the articles to pass along drain bars 36 and through pipe 35 into helical conveyor 11.

Cleaning liquid enters primary wash tank 20 through inlet pipe 37 and flows down through the cylindrical housing
25 30 in a counter-current manner to the direction of travel of the articles. The cleaning liquid is provided to inlet 37

via pump 38 through suitable conduit (not shown) and after passage through the interior of tank 20, is collected into collection tray 39. The collection tray 39 is overlaid with a screen 40 (not shown) which screens dirt and other foreign matter from the cleansing fluid prior to entering the collection tray.

In use, soiled articles such as golf balls are placed into hopper 30. Golf balls are passed from the hopper to the interior of the primary wash tank and are guided into the spiral ball guide 22. Upon rotation of brush 23, the golf balls are urged along the ball guide 22 and the combination of the brushing action of the brush and friction with the cleaning surface in the ball guide together with the presence of the cleaning liquid causes the balls to be cleansed in a passage through the guide.

Upon exit of the primary wash tank, the balls pass over drain bars 36 to allow excess cleaning liquid to drain off. The drain bars also permit any foreign bodies which have passed through the primary wash tank to fall away from the golf balls prior to entry into the helical conveyor. The balls are subsequently passed into the helical conveyor through pipe 35 to be located between fender elements 15 and 16. The balls are then transported along the helical conveyor and are dried and polished by means of contact with the thick cloth material.

A second embodiment of the invention is disclosed

in Figure 5. In this embodiment, there is provided an apparatus for cleansing articles such as golf balls. The apparatus comprises a helical conveyor 40 having a channel 41 extending between adjacent turns of the conveyor. The conveyor 40 is located within a housing 42 having a removable flexible cover 43. In this embodiment, the helical conveyor comprises an auger. The auger is mounted for rotation on shaft 44 which is rotated by drive motor 45. The auger is inclined at an angle of approximately 45° by support frame 46.

An inlet 47 is located adjacent the lower end of auger 40. The inlet is provided with a funnel 48 to facilitate entry of articles such as golf balls into the channel of the auger. An outlet 49 is associated with the upper end of auger 40 and is further provided with a return pipe 50. The lower half of auger 40 is lined with an abrasive material such as bristles or artificial carpet whilst the upper half of the auger is lined with a cloth material such as towelling to dry the articles.

The lower half of the auger is associated with sprayers 51 which are spaced above the auger and function to spray cleaning fluid onto articles being conveyed by the auger. Cleaning fluid is provided to sprayers 51 from a holding tank 52 by means of a pump 53. Cleansing fluid can comprise a detergent and water mixture. The flexible cover 43 provides a closed environment around the auger and the

sprayers.

As with the embodiment of figure 1, a pair of fender elements connected by a web portion to define an inverted channel are spaced above the auger and articles transported along the auger are trapped within the inverted channel. For the sake of clarity, the inverted channel has not been shown in Figure 5.

A third embodiment of the invention is shown in Figure 6. In this embodiment, there is provided an apparatus for cleansing articles such as vegetables and fruits. The apparatus comprises a helical conveyor 60 which is formed from an elongate cylindrical brush having a central shaft 61 and radially extending bristles 62. A helical channel 63 is cut into the periphery of the bristles 62. Shaft 61 is connected at one end thereof to drive motor 64 through pulleys 65, 66 and drive belts 67, 68. The other end of shaft 61 is supported for rotation by a collar 69.

A pair of fender elements 70, 71 are angularly spaced from the periphery of the helical conveyor 60. The fender elements comprise elongate rectangular plate members which extend along the length of the helical conveyor. The plate members are lined on their interior surface with cushioning material which may be overlaid by a cleaning surface. One of the fender elements 70, 71 is positioned substantially vertically above helical conveyor 60 while the second fender element is spaced at an angle of approximately

45° with respect to the first fender element.

The second fender element is positioned such that rotation of helical conveyor 60 will be such that any point of the conveyor passes from the second fender element to the first fender element. The spacing between the helical conveyor and the fender element can be adjusted as can the angle of the fender elements with respect to each other and with respect to the helical conveyor. The spacing between fender elements can also be adjusted. These adjustments are provided by means of threaded shafts 73 attached to the fender elements which pass through collars 74 which are welded to a supporting frame 75. A pair of nuts 76, 77 are threaded on each shaft 75 and are located on each end of collar 74. Loosening of one nut and tightening of the other nut results in adjustment of the fender element with respect to the conveyor. In this manner, the spacing between fender elements or the spacing between a fender element and the periphery of a helical conveyor can be adjusted to suit the type of article to be conveyed thereby.

The helical channel 63 cut into the bristles ensures that articles are cleaned by contact with the bristles in the channel upon transportation along the helical conveyor.

The whole apparatus can be associated with treatment steps such as sprayers, dryers, waxing or polishing steps which can be located at various positions

along the helical conveyor.

In use, articles are introduced into one end of the conveyor between the fender elements 70 and 71. Rotation of the helical conveyor results in articles being conveyed therealong. An article will move with rotation of the conveyor until it strikes the upper fender element 70. Thereafter it may become dislodged from the channel 63 and may fall to a position adjacent fender element 71 whereupon it will be captured by the next channel and further transported. Alternately, an article may be maintained within the channel and will be transported along the helical conveyor while being in abutment with fender element 70 or 71 depending on the direction of rotation of the conveyor. The bristles will, in this manner, clean all surfaces of the article. In figure 6, the helical conveyor is rotated in anticlockwise direction. Fender element 70 may be provided with cut-out portions (not shown) towards the end thereof which may be of different sizes or shapes or may be stepped such that articles of fruit or vegetables conveyed along the helical conveyor will be graded according to size or shape.

Thus, it can be appreciated that the invention provides a viable alternative in cleansing a wide variety of articles. The helical conveyor allows articles to be moved at various rates in single fashion thereby minimising damage or bruising to articles. The fender element or elements function to locate the articles on the helical conveyor. It

can be appreciated that various other modifications can be made to the embodiment described without departing from the spirit and scope of the invention as defined in the appended claims. In particular, the apparatus can be associated with
5 any number of similar apparatus in series or parallel fashion, it may be associated with any type of other treatment steps and may be associated with other known produce handling or treatment apparatus.

CLAIMS

1. Apparatus for cleaning discrete articles, said apparatus comprising a helical conveyor having a channel between adjacent turns of sufficient width to accommodate discrete articles therein, and at least one fender element for assisting said articles in their movement along the channel when said helical conveyor is rotated about its longitudinal axis, whereby said articles are cleaned by contact with the sides of said channel.
2. The apparatus as claimed in claim 1, comprising a pair of said fender elements and wherein said articles are locatable between said pair of fender elements.
3. The apparatus as claimed in claim 2, wherein said fender elements are located adjacent to the periphery of said helical conveyor.
4. The apparatus as claimed in claim 3, wherein the relative position of the fender elements with respect to the periphery of said helical conveyor is adjustable.
5. The apparatus as claimed in claim 2, wherein the spacing between said pair of fender elements is adjustable.
6. The apparatus as claimed in claim 2, wherein said pair of fender elements are angularly spaced about the periphery of the helical conveyor.
7. The apparatus as claimed in claim 6, wherein said fender elements define an acute angle relative to each other and one of said fender elements is located vertically above

said helical conveyor.

8. The apparatus as claimed in claim 2, wherein said pair of fender elements are connected by a web portion and wherein said articles are locatable between said web portion and said helical conveyor.

9. The apparatus as claimed in claim 1, wherein said fender element comprises an elongate substantially rectangular plate member.

10. The apparatus as claimed in claim 2, wherein one or both of said pair of fender elements is provided with one or more outlets to allow articles to exit said channel.

11. The apparatus as claimed in claim 1, wherein said helical conveyor comprises an auger and said channel along a portion of said auger is lined with cloth.

12. The apparatus as claimed in claim 11, wherein said cloth is absorbent and is selected from natural or synthetic fibres or mixtures thereof.

13. The apparatus as claimed in claim 1, wherein said helical conveyor comprises an elongate cylindrical member having a deformable surface and said channel is formed in said deformable surface.

14. The apparatus as claimed in claim 13, wherein said channel is formed in said deformable surface by winding and tensioning a flexible member around said deformable surface.

15. The apparatus as claimed in claim 14, wherein said flexible member is selected from a metal and plastics strap.

16. The apparatus as claimed in claim 1, wherein said helical conveyor comprises a cylindrical brush having a shaft and radially extending bristles and wherein said channel is cut or machined into said bristles.

17. The apparatus as claimed in claim 1, wherein said channel has a substantially U-shaped configuration.

18. The apparatus as claimed in claim 1, further comprising wash sprayers to wash said articles in said channel.

19. The apparatus as claimed in claim 1, further comprising dryers to dry articles in said channel.

20. The apparatus as claimed in claim 19, wherein said dryers are selected from air dryers, radiation dryers and/or contact dryers.

21. The apparatus as claimed in claim 1, further comprising wax applicators to wax articles in said channel.

22. The apparatus as claimed in claim 1, further comprising a washing and scrubbing tank to wash and scrub articles prior to entry onto said helical conveyor.

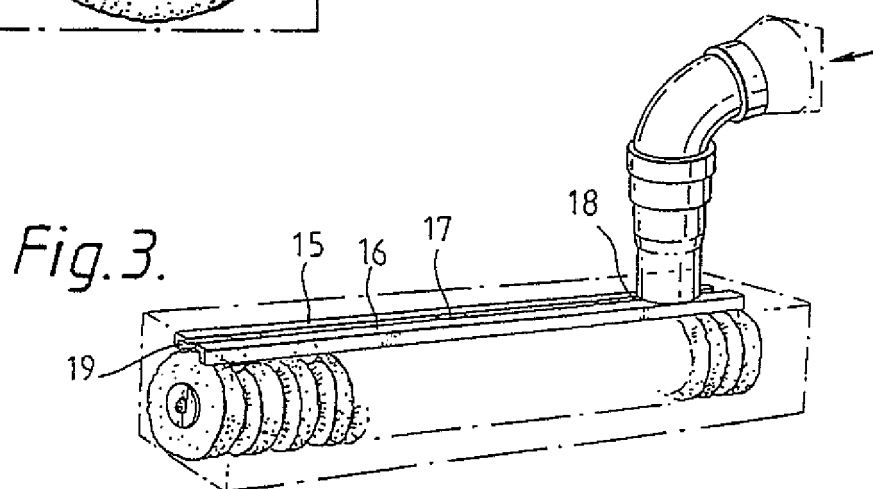
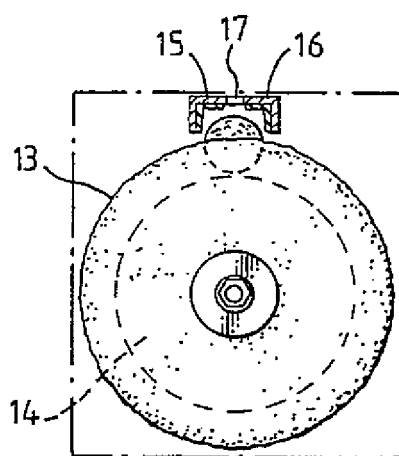
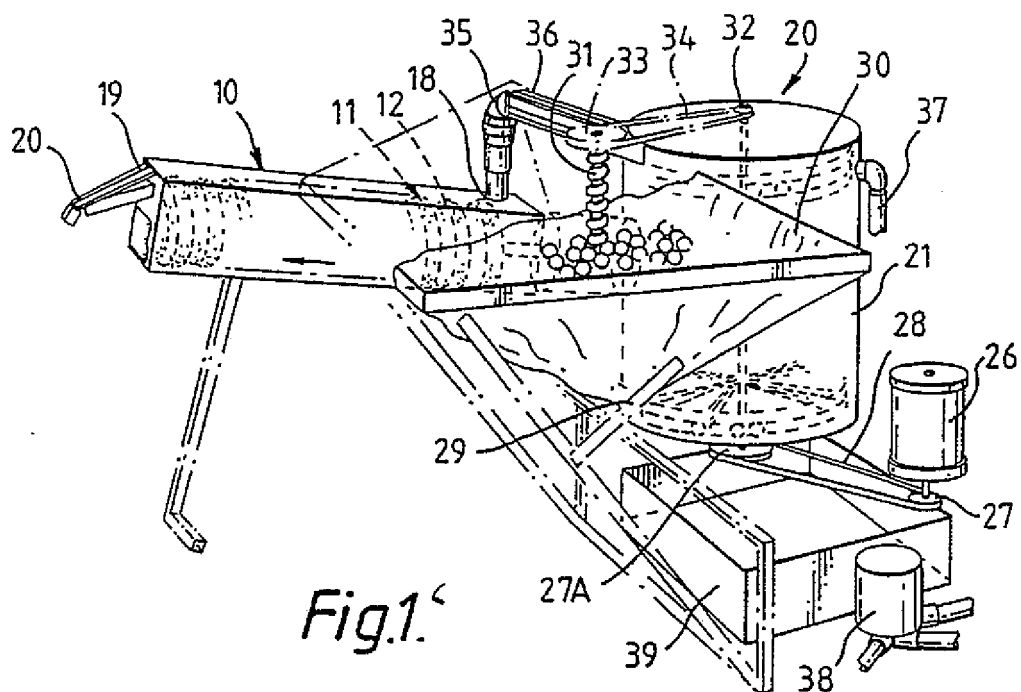
23. The apparatus as claimed in claim 22, wherein said tank comprises a cylindrical housing provided with a spiral track on an interior wall thereof, and a rotatable brush extending longitudinally within said tank, whereby articles are conveyed through said spiral track from an inlet to an outlet by contact with said rotatable brush, said tank further comprising fluid inlet and outlet means whereby said

articles and said rotatable brush are contacted with the fluid during conveying of said articles through said spiral track.

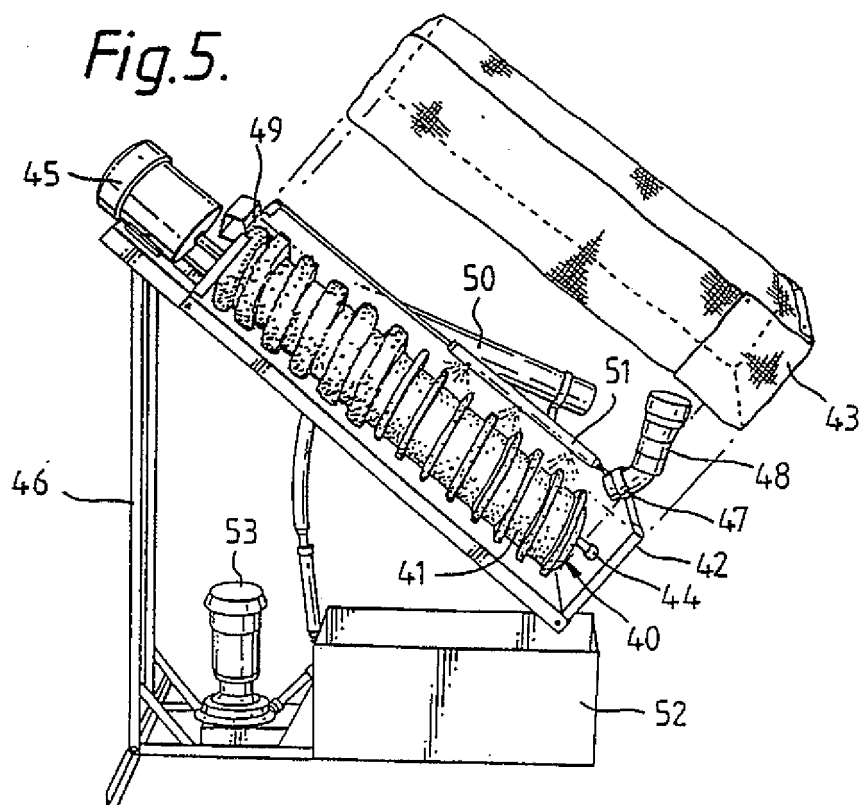
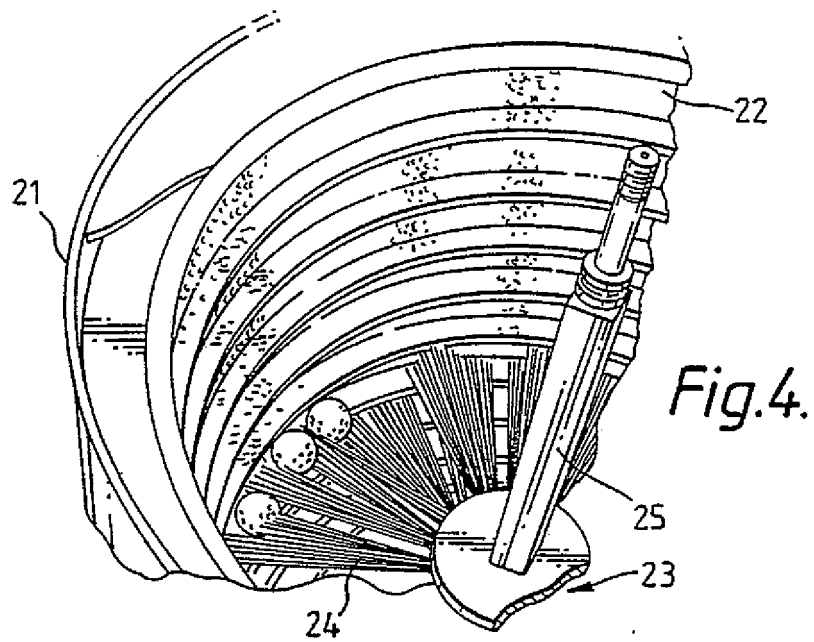
24. An apparatus as claimed in claim 1, particularly adapted for cleaning golf balls.

25. An apparatus as claimed in claim 1 particularly adapted for cleaning fruit, vegetables or eggs.

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2/3



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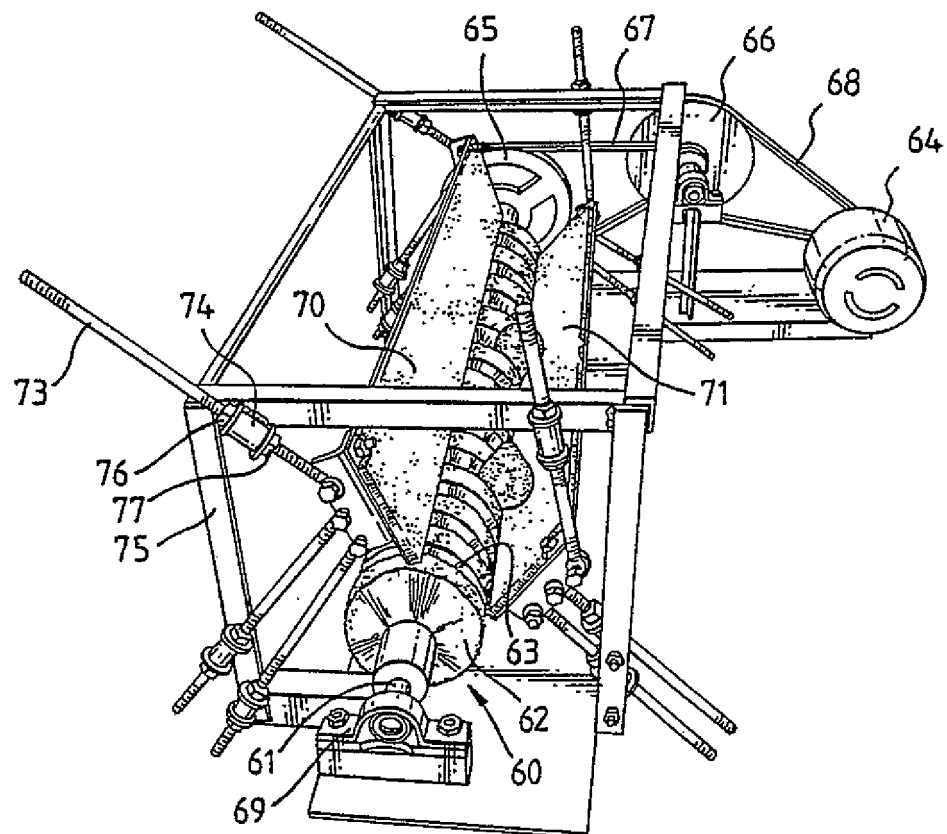


Fig. 6.

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 6

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.⁴ B08B 1/02, A43B 47/04, A23N 12/00, A01K 43/00

II. FIELDS SEARCHED

Minimum Documentation Searched 7

Classification System	Classification Symbols
IPC	B08B 1/02, A43B 47/04, A23N 12/00, A01K 43/00

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched 8

AU: IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT 9

Category*	Citation of Document, with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
X	US,A,2005115 (STUTZ) 18 June 1935 (18.06.35)	(1-25)
A	US,A,1807023 (YOUNG) 26 May 1931 (26.05.31)	(1-25)
A	US,A,2357892 (GRANT) 12 September 1944 (12.09.44)	(1-25)
A	US,A,2690576 (DREESMAN) 5 October 1954 (05.10.54)	(1-25)
A	US,A,4773114 (THRASHER) 27 September 1988 (27.09.88)	(1-25)

- * Special categories of cited documents: 10
- | | |
|---|---|
| "A" document defining the general state of the art which is not considered to be of particular relevance | "T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "E" earlier document but published on or after the international filing date | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. |
| "O" document referring to an oral disclosure, use, exhibition or other means | "&" document member of the same patent family |
| "P" document published prior to the international filing date but later than the priority date claimed | |

IV. CERTIFICATION

Date of the Actual Completion of the International Search 8 November 1989 (08.11.89)	Date of Mailing of this International Search Report 14 November 1989
International Searching Authority Australian Patent Office	Signature of Authorized Officer A. WINCH <i>[Signature]</i>